Appendix C
Biological Assessment

Endangered Species Act

BIOLOGICAL ASSESSMENT
For
Waste Disposition Activities at the Paducah Site
McCracken County, Kentucky

August 1, 2003

U.S. Department of Energy
Oak Ridge Operations Office
Oak Ridge, TN

SUMMARY

The U.S. Department of Energy (DOE) completed an *Environmental Assessment for Waste Disposition Activities at the Paducah Site, Paducah, Kentucky,* (DOE 2002) (Waste Disposition EA), including a Biological Assessment for Waste Disposition Activities in Appendix F of the document, and issued a Finding of No Significant Impact on November 4, 2002. The Waste Disposition EA analyzed disposition of approximately 11,000 m^3 of various wastes. At the time of issuance of the Waste Disposition EA, DOE anticipated that the removal of remaining waste and materials stored on-site would be conducted as decontamination and decommissioning (D&D) activities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

DOE subsequently decided to proceed with disposition of additional waste and materials in a timelier manner under the authority of the Atomic Energy Act, rather than waiting until D&D occurs. To support this decision, DOE has prepared an *Environmental Assessment Addendum for Disposition of Additional Waste at the Paducah Site* (DOE 2003) (Waste Disposition EA Addendum) to supplement the previously prepared Waste Disposition EA. This Biological Assessment for Waste Disposition Activities at the Paducah Site (Waste Disposition BA) has been prepared to assess impacts to federally listed species from activities in the EA and EA addendum.

The Waste Disposition BA evaluates potential impacts on federally listed animal species that could result from the implementation of the revised proposed action. The species considered in this Waste Disposition BA are the endangered Indiana bat and the following mussel species: orangefoot pimpleback, pink mucket, ring pink, and fat pocketbook as identified in a letter from the U.S. Fish and Wildlife Service (FWS) to the DOE, dated June 17, 2003 (FWS 2003).

DOE concludes, for the reasons described in the main text of this Waste Disposition BA, that the revised proposed action is not likely to affect these species adversely. In addition, since no proposed or designated critical habitats are present on, or near, the locations where activities would occur, none would be affected.

CONTENTS

ACRONYMS

BA	Biological Assessment
BJC	Bechtel Jacobs Company LLC
DMSA	DOE Material Storage Area
DOE	U.S. Department of Energy
EA	Environmental Assessment
FWS	U.S. Fish and Wildlife Service
KDFWR	Kentucky Department of Fish and Wildlife Resources
KPDES	Kentucky Pollutant Discharge Elimination System
KSNPC	Kentucky State Nature Preserves Commission
LLW	low-level waste
MLLW	mixed low-level waste
NFA	no further action
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act of 1976
TRU	transuranic
WKWMA	West Kentucky Wildlife Management Area

1. INTRODUCTION AND PROJECT DESCRIPTION

The U.S. Department of Energy (DOE)-Oak Ridge Operations has various waste types located at the Paducah Site that must undergo disposition activities. Disposition activities evaluated in the Waste Disposition EA include waste storage, sampling, characterization, packaging, surveillance, on-site and/or off-site treatment, transportation, and disposal, as well as other activities performed to support these tasks. Examples of supporting activities include vehicle fueling, facility maintenance, and storage container inspections.

The Waste Disposition EA Addendum describes and evaluates potential impacts associated with the revised proposed action. The revised proposed action description states that DOE proposes to disposition 17,600 m^3 of additional waste. This volume is in addition to the 11,000 m^3 of various waste types analyzed in the Waste Disposition EA and results in a total of 28,600 m^3 of waste and material. Disposition activities for the additional waste and material are identical to the disposition activities defined and analyzed in the Waste Disposition EA and include characterization, storage, packaging, handling, and shipping wastes to disposal locations. No new on-site activities are anticipated for the revised proposed action. All waste would be transported in the same timeframe, same manner, same representative locations, and same representative routes as described in the Waste Disposition EA.

Most of the additional waste and material described in the revised proposed action is currently stored in approximately 160 DOE Material Storage Areas (DMSAs) at the Paducah Site. DOE anticipates that characterization of the waste and material would occur over a 10-year period. Upon completion of characterization, wastes would be dispositioned intermittently throughout the 10 years.

1.1 WASTE STORAGE

Under the revised proposed action, all waste and material would be stored at the Paducah Site until scheduled for treatment, disposal, or transport. Existing facilities will be used for waste storage.

1.2 WASTE TREATMENT – ONSITE

On-site treatment applies to approximately 200 m^3 (7060 ft^3) of the total waste volume. Onsite treatment includes up to 120 m^3 (4238 ft^3) of mixed low-level waste (MLLW) solids, 12 m^3 (424 ft^2) of ^{99}Tc-contaminated MLLW, and 10 m^3 (353 ft^2) of TRU waste. On-site treatment technologies are limited by the Paducah Site Resource Conservation and Recovery Act of 1976 (RCRA) Part B permit. RCRA-permitted on-site treatment technologies include sedimentation, precipitation, oxidation, reduction, neutralization, cementation/solidification, carbon adsorption, photocatalytic conversion, and lime precipitation. Currently, only neutralization, stabilization, carbon adsorption, and photocatalytic conversion are planned on-site. These are the only technologies discussed in subsequent sections because they are the ones applicable to the waste types presented. Building C-752-A has been proposed as the site for processing any on-site

waste that needs to be treated indoors. Building C-746A is the proposed location for light bulb crushing.

Approximately 52 m^3 (1836 ft^3)/year of low-level waste (LLW) wastewater would also be treated on-site. Wastewater would be treated on-site by carbon adsorption, photocatylic conversion, and/or lime precipitation. These treatment activities would be compliant with the applicable Kentucky Pollutant Discharge Elimination System (KPDES) permit(s).

1.3 WASTE TREATMENT – OFFSITE

DOE's revised proposed action for off-site treatment varies by waste type. The characteristics of the waste govern where and how each waste type may be treated. The preferred treatment scenario for each type of currently known waste is listed below.

Fifty metric tons of capacitors containing polychlorinated biphenyls (PCBs) are proposed for shipment to Deer Park, Texas, for treatment and disposal. The capacitors would be shipped in 23 7A, Type A containers. Thirteen empty transformers weighing 78 metric tons would be shipped for off-site treatment and disposal as well. These transformers contain some residual PCB contamination.

The 5355 m^3 (189,110 ft^3) of MLLW addressed in the revised proposed action represents a very heterogeneous grouping of wastes; most of this waste will be treated and disposed at off-site, permitted facilities. A small portion contains PCBs, metals, and organics, and it is proposed that they be treated at the DOE Toxic Substances Control Act of 1976 Incinerator in Oak Ridge, Tennessee.

1.4 WASTE TRANSPORTATION

The representative truck and rail routes previously identified in the Waste Disposition EA are applicable to the revised proposed action. However, the projected number of waste shipments has changed from the previously analyzed shipment rate of 762 shipments per year. The 17,600 m^3 of additional waste and materials would be transported in shipments of 18.2m^3 each. Assuming the disposition of additional waste takes place over 10 years, which is consistent with the Waste Disposition EA analysis assumptions, a resulting additional shipment rate of 97 shipments per year is projected. Therefore, the revised annual shipment rate for waste shipments would include the original 762 shipments analyzed in the Waste Disposition EA, and the 97 additional shipments included in the Waste Disposition EA Addendum, resulting in 859 waste shipments per year for 10 years.

Waste will generally be transported by truck but may also be transported by rail or intermodal carrier when advantageous. DOE currently anticipates that the waste would be disposed primarily at the DOE Nevada Test Site although disposition at the Hanford Site and commercial facilities, such as Envirocare of Utah, Inc. and Waste Control Specialists, LLC in Texas, are also analyzed as possible locations.

1.5 WASTE DISPOSAL

DOE's revised proposed action for waste disposal varies by waste type. The characteristics of the waste govern where and how each waste type may be disposed. The volume of wastes to be transported from the Paducah Site to each proposed receiving facility represents only a small portion of the total waste each facility receives annually. For example, it has been proposed that approximately 3750 m^3 (132,430 ft^3) of radiological PCB wastes be shipped to the Envirocare facility in Utah over the 10-year evaluation period resulting in an average of 375 m^3 (13,243 ft^3) per year. The Envirocare facility annually receives 9061 m^3 (320,000 ft^3) of waste; therefore, the annual Paducah Site shipment will represent less than 5 percent of the facility's capacity in any given year. The preferred alternative for each waste type is listed below.

Capacitors containing PCBs are proposed for shipment to Deer Park, Texas, for treatment and disposal. Thirteen empty transformers would be shipped for off-site treatment and disposal as well. These transformers contain some residual PCB contamination.

Approximately 4600 m^3 (60,166 yd^3) of LLW would be disposed, primarily at the Nevada Test Site. Only the LLW water waste stream consisting of 52 m^3 (1836 ft^3) of waste would be treated and disposed on-site. The wastewater, which has some uranium contamination, would be treated until the KPDES limits had been met; this waste would then be discharged at a permitted on-site outfall. In addition to these wastes, there are 22 T-Hoppers (5-ton containers) of UF4 stored at the site. If it is determined that this material is a waste, it would likely be shipped as a LLW to the Nevada Test Site.

Some MLLW would be shipped to Envirocare for treatment and disposal. Approximately 160 m^3 (5650 ft^3) would be shipped to one or more of the Broad Spectrum Contractors (i.e., Waste Control Specialists LLC, Andrews, Texas; Allied Technology Group, Richland, Washington; Materials and Energy/Waste Control Specialists, Oak Ridge, Tennessee).

Approximately 10 m^3 of transuranic (TRU) liquids and solids are proposed for treatment on-site and shipment to the TRU Waste Program at Oak Ridge National Laboratory for ultimate disposition. Impacts associated with further processing and shipment to the Waste Isolation Pilot Plant near Carlsbad, New Mexico, are addressed in the final environmental impact statement for treating TRU and alpha LLW (DOE 2001a).

1.6 SUPPORTING ACTIVITIES

The revised proposed action for supporting waste disposition activities is to perform these activities in accordance with DOE orders, federal and state regulations, and approved Bechtel Jacobs Company LLC (BJC) or BJC subcontractor procedures. These activities are performed mainly during waste management and maintenance at the Paducah Site. Applicable procedures are implemented to ensure that activities are performed in a safe and accountable manner. Examples of supporting activities include, but are not limited to, the following:

- waste staging,
- on-site waste movement,
- packaging/repackaging,
- sorting,
- waste container decontamination,
- inspection,
- marking/labeling,
- characterization, and
- facility modifications or upgrades.

2. STATUS AND BIOLOGY OF THE LISTED SPECIES

As reported in the Biological Assessment (BA) for the *Paducah C-746-U Landfill Implementation of the Authorized Limits Process* (DOE 2001), informal consultations regarding the Indiana bat (*Myotis sodalis*) were conducted in May 2001 with the U.S. Fish and Wildlife Service (FWS), Kentucky Department of Fish and Wildlife Resources (KDFWR), and the Kentucky State Nature Preserves Commission (KSNPC) to ascertain the potential presence of any listed species. The FWS identified the Indiana bat as a Federally endangered species that could potentially occur near the site (FWS 2001). The Indiana bat is also listed as an endangered species by the Commonwealth of Kentucky. The KSNPC reported an occurrence of the Indiana bat in McCracken County (2000), but not at the Paducah site (DOE 2001a). This reported occurrence in McCracken County, a result of mist netting, was made in June 1991 and was on West Kentucky Wildlife Management Area (WKWMA) land in the Joppa Quadrangle near the Shawnee Steam Plant (Hines 2001). More recently, five individuals of the Indiana bat, *Myotis sodalis*, were captured in riparian hardwood habitat of the lower downstream reaches of Bayou Creek in the WKWMA during mist netting surveys in 1999 (KDFWR 2000). These locations were to the north of the Paducah Site. No mist net surveys have been conducted within the Paducah Site fence.

The KSNPC also reported the presence of the orange-footed pimpleback (*Plethobasus cooperianus*), pink mucket pearly mussel (*Lampsilis arbrupta)*, ring pink (*Obovaria retusa*), fat pocketbook (*Potamilis capax*) in the vicinity of Ohio River miles 945 through 949. Most recent observations of these species in the area occurred between 1992 and 1999 (KSNPC 2000).

As a result of these sightings, DOE has prepared this BA considering potential impacts of the revised proposed action to the Indiana bat, orange-footed pimpleback, pink mucket pearly mussel, ring pink, and fat pocketbook.

2.1 INDIANA BAT (MYOTIS SODALIS)

The general ecology of the Indiana bat is summarized as follows. Unless otherwise noted or referenced, general biological information on the species is derived from Harvey (1992 and 1999) and Webb (2000).

The range of the endangered Indiana bat is the eastern United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. Distribution is associated with major cave regions and areas north of cave regions. The present total population is estimated at ca. 352,000 with more than 85 percent hibernating at only nine locations - two caves and a mine in Missouri, three caves in Indiana, and three caves in Kentucky.

Indiana bats forage in and around tree canopies of floodplain, riparian, and upland forest. In riparian areas, Indiana bats primarily forage around and near riparian and floodplain trees (e.g., sycamore, cottonwood, black walnut, black willow, and oaks), and solitary trees and the forest edge on the floodplain. Streams, associated floodplain forests, and impounded bodies of water (e.g., ponds, wetlands, and reservoirs) are the preferred foraging habitat for pregnant and lactating Indiana bats, some of which may fly up to 1.5 miles from upland roosts. Indiana bats also forage within the canopy of upland forests, over clearings with early successional vegetation (e.g., old fields), along the borders of croplands, along wooded fencerows, and over farm ponds in pastures. Indiana bats return nightly to their foraging areas. Indiana bats feed strictly on flying insects and their selection of prey items reflects the environment in which they forage. Both aquatic and terrestrial insects are consumed. Moths, caddisflies, flies, mosquitoes, and midges are major prey items. Other prey include bees, wasps, flying ants, beetles, leafhoppers, and treehoppers.

Indiana bats hibernate in limestone caves from October to April, depending upon climatic conditions. Indiana bats usually hibernate in large, dense clusters of up to several thousand individuals in sections of the hibernation cave where temperatures average 38 to 43°F and with relative humidities of 66 to 95 percent. Bat clusters may contain 300 to 384 bats per square foot. The bats leave the caves and migrate to summer roosts in mid-spring.

Summer roosting-habitat criteria for Indiana bats are frequently revised as more is discovered about this species' habits. The most recent information applicable for the region is available from the FWS Cookeville Office (Components of Suitable Habitat for the Endangered Indiana Bat). In general, Indiana bats establish summer maternity and sometimes male night roosts or bachelor colonies under the loose bark of large, usually hardwood trees (> 20 cm diameter). Indiana bats have been observed to return to the same roosting and foraging habitat year after year. Indiana bats forage at night and feed on insects.

Female Indiana bats depart the caves before the males and arrive at summer maternity roosts in mid-May. A single offspring, born in June, is raised by the mother under loose tree bark, primarily in wooded streamside habitat. Mothers and babies reside

in maternity colonies that use multiple, primary roost trees throughout most of the summer. Secondary roosts are used intermittently by some of the bats, particularly during periods of extreme precipitation or extreme temperatures. Thus, there may be more than a dozen roosts used by some Indiana bat colonies. Kurta et al. (1996) found that female Indiana bats may change roosts about every three days, and a group of these bats may use more than 17 different trees in a single maternity season. They depart the summer roosts for hibernation caves in September. The summer roost of the adult males is often near the maternity roost, although a few males do stay in caves over the summer.

In 1974 the first maternity colony was discovered under the loose bark of a dead butternut hickory tree in east-central Indiana. The colony numbered about 50 individuals and also used an alternate roost under the bark of a living shagbark hickory tree. The total foraging range of the colony consisted of a linear strip along approximately 0.5 miles of creek. Foraging habitat was confined to air space from 6 ft to ca. 95 ft high near the foliage of streamside and floodplain trees. Two additional colonies were discovered during subsequent summers, also in east-central Indiana. These had estimated populations of 100 and 91 respectively, including females and pups. Habitat and foraging areas were similar to the first colony discovered. Evidence gathered during recent years indicates that, during summer, Indiana bats are widely dispersed in suitable habitat throughout a large portion of their range. Additional maternity colonies have been discovered using radiotelemetry techniques in more recent years. Data thus far reinforce the belief that floodplain forest is an important habitat for Indiana bat summer populations. However, colonies have been located in upland and in coniferous habitats as well.

A longevity record of 13 years and 10 months has been recorded for the Indiana bat. Hibernating bats leave little evidence of their past numbers; thus, it is difficult to calculate a realistic estimate of the population decline for this species. However, population estimates at major hibernacula indicated a 34 percent decline in the total Indiana bat population from 1983 to 1989.

2.2 PINK MUCKET PEARLY MUSSEL (*LAMPSILIS ARBRUPTA* SAY-1831; ALSO CALLED *L. ORBICULATA* HILDRETH-1828) (Conservation Management Institute 2001, EPA 2001)

The Federally endangered pink mucket pearly mussel (41 FR 24062; June 14, 1976) is a bivalve aquatic mollusk in the Unionidae family with an elliptical-shaped shell. The species is generally about 10.2 cm (4 inches) long, 6.1 cm (2.4 inches) wide, and 7.6 cm (3 inches) high. The valves are heavy and thick. The species is sexually dimorphic, with both males and females having rounded anterior margins, but males having a pointed posterior margin and females a truncated, expanded posterior to accommodate the gravid condition. Young mussels have a yellow to brown shell that is smooth and glossy with green rays, while older specimens are dull brown. The nacre color varies from white to pink, with the posterior margin being iridescent.

The early life stage of the mussel, glochidium, is an obligate parasite on the gills or fins of fish, but the required fish host species are unknown. The adult mussels are filter feeders and consume particulate matter that is suspended in the water column.

Identifiable stomach contents from mussels invariably include mud, desmids, diatoms, protozoa, and zooplankton. However, studies on the food habits for this species have not been conducted, so its specific food requirements are not known. The species has no known commercial value. The reproductive cycle of the pink mucket is presumed to be similar to that of other freshwater mussels. Males release sperm into the water column, which is then taken up by the females during siphoning and results in the eggs being fertilized. The embryos develop into the glochidia inside the female and are then released into the water column. The glochidia must then attach to suitable fish hosts for metamorphosis to the free-living juvenile stage. There is no information on the population biology of this species.

The pink mucket is found in medium to large rivers. It seems to prefer larger rivers with moderate- to fast-flowing water, at depths from 0.5 to 8.0 m (1.6 to 26.2 ft). The species has been found in substrates including gravel, cobble, sand, or boulders. Silt clogs the species' siphon, so silty substrates and water columns are not conducive to the species being present. Habitat of the glochidia is initially within the gills of the female, then in the water column, and finally attached to a suitable fish host. Habitat requirements for the juvenile stage are unknown. Any alteration of the life-stage-specific habitats during the pink mucket's lifecycle would likely affect the long-term success of a population. In addition, impoundments and surface water contaminants are known to adversely affect this species and contribute to its decline in numbers.

Currently, the pink mucket is known in 16 rivers and tributaries from seven states, with the greatest concentrations in the Tennessee (Tennessee, Alabama) and Cumberland (Tennessee, Kentucky) rivers and in the Osage and Meramec rivers in Missouri. Smaller populations have been found in the Clinch River (Tennessee); Green River (Kentucky); Ohio River (Illinois); Kwanawha River (West Virginia); Big Black, Little Black, and Gasconde rivers (Missouri); and Current and Spring rivers (Arkansas).

2.3 ORANGEFOOT PIMPLEBACK (*PLETHOBASUS COOPERIANUS*) (IDNR 2001)

The Federally endangered orangefoot pimpleback mussel (a.k.a orangefoot pearly mussel) is a bivalve aquatic mussel in the Unionidae family with a round-shaped shell. The shell is thick, moderately inflated to compressed, and contains pustules on the posterior three-fourths of the shell. The anterior end of the shell is rounded whereas the posterior end is rounded to bluntly pointed. The mussel is light brown in color in small specimens, becoming chestnut or dark brown in color in larger individuals. The beak cavity is very deep. The nacre is white, usually with pink or salmon tinge near the beak cavity. Length ranges up to 4 inches (10.2 cm). The foot of living specimens is orange in color.

Specific reproductive or other life history information for this species was not found in the literature. However, the reproductive cycle is presumed to be similar to that of other freshwater Unionidae mussels, as previously described for the pink mucket pearly mussel.

The orangefoot pimpleback mussel prefers large rivers with gravel or mixed sand and gravel substrates. This species does not tolerate silty conditions.

Information on this species' historical range was not found in the literature by searching the Internet using the keywords "orangefoot pimpleback." Current range of this species includes the Ohio River in reaches adjacent to Ohio, Indiana, Illinois, and Kentucky.

2.4 RING PINK (OBOVARIA RETUSA)

The ring pink mussel was listed as an endangered species without critical habitat on September 29, 1989 (54 FR 40109). The FWS (FWS 1991) formerly referred to this mussel as the golf stick pearly mussel. The ring pink mussel is one of the most endangered mussels because all of the known populations are apparently too old to reproduce. The ring pink has a medium to large shell that is ovate to subquadrate in outline. The exterior of the shell lacks rays and is yellow-green to brown in color, while older specimens are usually darker brown or black. The nacre of the shell is usually salmon to deep purple in color surrounded by a white border.

The food habits of this species are unknown, but it likely feeds on detritus, diatoms, phytoplankton, and zooplankton. These food items are common for most freshwater mussels (FWS 1991).

The reproductive biology for the ring pink is essentially unknown, but it likely reproduces similarly to other freshwater Unionidae mussels as described above for the pink mucket pearly mussel. The fish host(s) for the ring pink and habitat utilized by the juvenile mussels are unknown.

This mussel is characterized as a large-river species (FWS 1991). The mussel inhabits the sandy and gravelly but silt-free bottoms of large rivers and prefers rather shallow water depths (2 ft deep).

Historically, this mussel was widely distributed and found in several major tributaries of the Ohio River, including those that stretched into Alabama, Kentucky, Illinois, Indiana, Ohio, Pennsylvania, and West Virginia. However, the species was last taken in Pennsylvania in 1908, and in Ohio in 1938 (FWS 1991). According to records, this species has not been collected in Indiana in decades, and has not been collected from Illinois in over 30 years (FWS 1991). Most of the historically known ring pink mussel populations were apparently lost due to conversion of many sections of the large rivers to a series of large impoundments. The ring pink mussel does not survive in impounded water habitats.

The ring pink mussel is presently known from only five river reaches, including two in Kentucky, two in Tennessee, and one in West Virginia. In Kentucky, the ring pink mussel in recent years has only been taken from the Tennessee River in McCracken, Livingston, and Marshall Counties, and from the Green River in Hart and Edmonson Counties. Only two live specimens have been collected from the Tennessee River

population in recent years; one in 1985 and one in 1986. The last live specimen from the Green River was collected in the mid-1960s. Two fresh-dead specimens were collected in the Green River (one in 1987, the other in 1989) in the reach between Munfordville and Mammoth Cave National Park.

According to the Recovery Plan for Ring Pink Mussel (FWS 1991), total recovery of this species is considered unlikely because none of the five extant populations are known to be reproducing. Therefore, unless reproducing populations can be found or methods can be developed to maintain or create new populations, the species will be lost in the foreseeable future.

2.5 FAT POCKETBOOK (*POTAMILIS CAPAX*) (Earth's Endangered Creatures 2001, IDNR 2001)

The fat pocketbook mussel was listed as a Federally endangered species in 1976 (41 FR 24064). Green first described the mussel in 1832 under the name *Unio capax*. The genus was changed to *Lampsilis* by Smith (1899), then moved to the genus *Proptera* Ortman (1914). In 1969, Morrison noted that Rafinesque (1818) has named this genus *Potamilus*. Since 1988, the genus name for this species has been *Potamilus*.

The fat pocketbook mussel has a quite rounded and inflated shell that is thin to moderately thick. The shell is shiny and smooth, yellow to brown in color, and lacks any distinctive markings. It has an S-shaped hinge line that distinguishes it from similar species. The beak cavity is very deep. The nacre is white, sometimes tinged with pink or salmon color. Shell length is up to 5 inches (12.7 cm).

The reproductive biology for the fat pocketbook is essentially unknown, but it is likely similar to that of other members of the Unionidae as described above for the pink mucket pearly mussel. The fat pocketbook mussel is probably a long-term breeder and is reported gravid in June, July, August, and October (FWS 1989). The fish host species are not known but are likely large river species. Fish hosts known for other mussels of this genus include freshwater drum (*Aplodinotus grunniens*), white crappie (*Pomoxis annularis*), and blackstripe topminnow (*Fundulus notatus*).

The fat pocketbook mussel inhabits rivers and streams with sand, mud, or gravel substrates. It prefers slow-flowing water where depths range from a few inches to 8 ft. The mussel buries itself in these substrates with only the edge of its shell and its feeding siphons exposed.

There are few published records on the historical distribution of this species for the period prior to 1970. Museum records indicated that most fat pocketbook occurrences were from three areas; the upper Mississippi River (above St. Louis, Missouri), the Wabash River in Indiana, and the St. Francis River in Arkansas. There are a few historic records of this species occurring in the Illinois River, but is has not been found in recent years (FWS 1989).

Currently, the fat pocketbook in the mid-west is found only in the lower Wabash River in Indiana, the Ohio River adjacent to Kentucky, Indiana, and Illinois, and in the lower Cumberland River in Kentucky. Farther south, this species is known to exist in the St. Francis floodway (west of the flood control levee) from the confluence with the St. Francis River upstream to the confluence of Iron Mines Creek, and numerous drainage ditches associated with these streams in Arkansas (FWS 1989).

3. ECOLOGICAL DESCRIPTION OF THE SITE

The Paducah Site consists of existing industrialized areas of the Paducah Gaseous Diffusion Plant and is near the WKWMA on the site's western side. The majority of the fenced site has been cleared and, where vegetative cover is present, is maintained by mowing. Vegetation on the site consists of grasses and other herbaceous ground cover, which provides no foraging or roosting habitat for the Indiana bat.

The Paducah Site is located in the western part of the Ohio River Basin. The confluence of the Ohio and Tennessee rivers is approximately 16 km (10 miles) upstream of the site. The confluence of the Ohio River with the Mississippi River is approximately 32 km (20 miles) downstream of the site. All mussel species listed in the FWS letter are present in the Ohio River, upstream of the Paducah Site.

The Paducah Site is located on a local drainage divide; surface flow is to the east and northeast toward Little Bayou Creek and to the west and northwest toward Bayou Creek. The confluence of the creeks is approximately 5 km (3 miles) north of the site. Little Bayou Creek originates in the WKWMA and flows north toward the Ohio River along a 10.5-km (6.5-mile) course through the eastern portion of the DOE reservation. These tributaries are partially bordered by a thin riparian zone of plants. Trees, when present in close proximity to the site, mainly occur along the two tributaries, and are generally less than 20 cm in diameter at breast height and do not have loose bark as required by roosting Indiana bats. The riparian area could provide foraging habitat but no roosting habitat for the Indiana bat. No mussel species of concern have been identified in the tributaries.

Although the site has no hibernating, roosting, or foraging habitat as described above, the creeks within an expanded area around the site do provide Indiana bat summer foraging habitat. No maternity roosts have been located on the WKWMA, but five individuals, including three juveniles, were captured in the WKWMA during mist netting surveys in 1999 (KDFWS 2000) and a single specimen was reported in 1991 (KSNPC 2000).

The nearby WKWMA consists primarily of stands of bottomland hardwoods interspersed with upland hardwoods and old fields. Potential summer roosting and foraging habitats for the Indiana bat are present in the WKWMA, although most trees are less than 20 cm in diameter (see reported identifications below). The Bayou Creek (formerly known as Big Bayou Creek) is the nearest blue-line stream in the area; the nearest of its tributaries to the site are on the western side of the WKWMA.

4. POTENTIAL IMPACTS TO INDIANA BAT

The revised proposed action would not entail alteration or loss of bat habitat because it would take place at an existing site using existing buildings. Opportunities for bats to come into contact with the waste, either directly or indirectly, are virtually nonexistent since the wastes are contained within storage facilities. During waste disposition activities that would occur outside, such as transport, waste handling procedures would be followed and the waste would be properly packaged and covered; thus, not providing access to bats or insects on which the bats may feed.

The only scenario that could result in exposure of bats to the wastes would be an accidental release of wastes into the environment. Risks to terrestrial biota resulting from site accidents are addressed in the Waste Disposition EA and are summarized as follows.

The scenario for chronic radionuclide exposure as a result of the modeled worst-case spill indicated that the sum of chronic terrestrial exposures would be about 7×10^{-10} of the tolerable daily radiation dose as indicated by no-further-action (NFA) levels; therefore, in even this worst-case accident scenario, long-term radiation effects to soil biota would be negligible.

Two organics (PCB and 1,2,4-trichlorobenzene) and two inorganics (cadmium and chromium) have modeled concentrations that exceed the NFA benchmarks. This indicates that these constituents would likely pose adverse impacts to soil biota if the worst-case spill accident occurred. However, any insects that the bats may eat could only ingest or come into contact with the waste if they were present on the exact location where the accident occurred. These insects would then need to be available as prey for the bats, or as prey for other insects that the bats forage on, in order for radioactivity from waste to be ingested by an Indiana bat.

With the increase in traffic associated with the revised proposed action there is an increase in the potential risk of bat exposure to emissions and vehicle accidents resulting in animal fatalities. However, these potential impacts are estimated to be *de minimus* given that bat foraging habitat (around tree canopies of riparian and upland forest) and roosting-habitat (under the loose bark of large hardwood trees) occur in wooded areas not likely to be present near proposed transportation routes.

5. POTENTIAL IMPACTS TO MUSSELS

Potential impacts of the revised proposed action were evaluated for the orangefoot pearly mussel, as well as for aquatic biota, and presented in the Waste Disposition EA. The Waste Disposition EA concluded that none of the seven radionuclide or nine chemical contaminants exceeded radiological or toxicological benchmarks for aquatic biota as a result of any waste storage, water treatment, waste disposal, or supporting activities associated with the revised proposed action. The Waste Disposition EA stated that during a worst-case accident scenario (earthquake), sufficient PCBs potentially could reach the Ohio River and slightly exceed the toxicological benchmark for aquatic biota.

However, the modeled PCB concentration for the earthquake accident scenario was very conservative because it assumed that all of the PCB released during the accident made its way from the Paducah site into the Ohio River, which is nearly 5 miles downstream along Bayou Creek. In addition, the contaminants would be diluted and represent a negligible addition to those already in the Ohio River. The Waste Disposition EA concluded that the addition of contaminants from the worst-case accident would result in sediment concentrations within the measured variability reported for Ohio River sediments. As a result, the Waste Disposition EA concluded that the contaminants reaching the Ohio River from the Revised proposed action and the worst-case accident scenario would cause negligible adverse impacts to the orangefoot pearly mussel as well as other aquatic biota.

Additional evidence indicates that the four endangered mussels addressed in this BA are at a negligible risk of adverse impact from the revised proposed action. None of the four endangered mussels are known to occur on the Paducah Site where the revised proposed action activities would take place. In addition, none of the endangered mussels occur in Bayou Creek or Little Bayou Creek because these creeks are too small to provide the necessary habitat requirements for the mussels. The only water body that potentially could harbor the four endangered mussels and potentially be impacted from the revised proposed action is the Ohio River. As previously stated, the Waste Disposition EA (DOE 2002) indicated that potential adverse impacts to the orangefoot pearly mussel in the Ohio River downstream of the confluence of Bayou Creek should be negligible to non-existent. Thus, the similarity of the known life history and habitat requirements for the four Unionidae endangered mussels makes it reasonable to conclude that the pink mucket, ring pink, and fat pocketbook mussels are also not at risk of adverse impacts from the revised proposed action.

The revised proposed action may raise the potential risk of mussel exposure to waste resulting from increased vehicle traffic and a corresponding potential increase in vehicular accidents. This potential increase in accidents could result in a release of the waste volume being transported on the truck. However, when compared to the potential impacts evaluated in the worse case accident scenario, in which the release was based on the entire volume of wastes stored on the site, these impacts are deemed negligible.

6. CONCLUSIONS

The revised proposed action would be unlikely to adversely affect the Indiana bat or any mussel species of concern because:

- A potential for exposure of the bat and mussel species to waste as a result of an accident during implementation of the revised proposed action would be small and impacts would be negligible or nonexistent;
- Waste disposition activities are currently being performed at the Paducah Site with no known detriment to the local Indiana bat or mussel populations;
- No bat foraging or roosting habitat is present where waste handling activities would occur or along any proposed transportation routes. Therefore, no bat foraging or roosting habitat would be affected by routine waste disposition operations;

- The majority of mussel habitat in the area has been identified upstream from the Paducah site; no mussel habitat exists inside the site fence therefore no habitats would be affected by the revised proposed action;
- Bat foraging habitat (riparian vegetation along intermittent tributaries) present near the site of the revised proposed action is unlikely to become contaminated;
- Routine waste management operating procedures would provide minimal opportunity for direct exposure of local biota, including Indiana bats and their prey, to wastes. Procedure implementation would also decrease the probability of accidents; and
- No critical bat or mussel habitats are present at the Paducah Site. Therefore, no habitat alteration or destruction would occur as a result of the revised proposed action.

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